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PATENT
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re REISSUE APPLICATION OF
WILLIAM L. GROUELL

Filed: April 6, 2001

Serial No.: 09/828,246

Original Patent No.: 5,892,655

Issued: April 6, 1999

Title: Hard Disk Drive Heat Sink

Art Unit: 2835

Examiner: Boris Leo Chervinsky

AFFIDAVIT OF WILLIAM GROUELL REGARDING NON OBVIOUSNESS PURSUANT TO 37 CFR § 1.132

Box REISSUE
Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

I, William L. Grouell, declare as follows:

I. INTRODUCTION

1. I am the named inventor of U.S. Patent No. 5,892,655 (hereafter referred to as the '655 patent), entitled HARD DISK DRIVE HEAT SINK, which issued on April 6, 1999, from U.S. Application Serial No. 08/883,847 filed on June 27, 1997.

2. I reside at 103 Boxford Place, San Ramon, CA 94583, am a citizen of the United States of America, and have a post office address identical to my residential address.

3. I have assigned my rights in the '655 patent to Sun Microsystems, Inc.

II. BACKGROUND

4. The present application discloses a shield (or heat sink) for use with a heat generating device, such as a hard disk drive containing a heat emitting motor. Specifically, the shield is used to dissipate heat from the hard disk drive (or more particularly the heat emitting motor within the disk drive) to the atmosphere. The shield is formed from a thermally conductive material and includes a plate and a plurality of louvered fins.

5. I am not aware of any disk drives that used a separate heat shield or a separate heat sink prior to my conception of this invention. In the past, disk drives did not produce very much heat. Thus, there was no need to use heat shields or heat sinks with disk drives.

6. In contrast, hard disk drives in use today generate considerable amounts of heat because of a substantial increase in disk drive power and storage capacity, a substantial increase in the rotational speed of the rotating platters of disk drives, and the increased heat generated by the spindle motors that are required to rotate the platters at the increased rotational speed. Further, based on consumer demand for more compact computer systems, disk drives in use today must only occupy a minimum amount of space.

7. To address the issue of overheating, prior art disk drives relied primarily on air spacing, not heat dissipation through a separate heat sink, to cool the disk drives. This prior art method disadvantageously required that the disk drives be housed in chassis that formed a large open space within the disk drive to allow for cooling via air spacing.

8. Other prior art disk drives also relied on the chassis in which the disk drive was housed as a make-shift heat sink to cool the disk drive by way of heat dissipation (through the cover of the chassis). The make-shift heat sinks, the chassis covers, did not dissipate heat effectively. These other disk drives, consequently, required greater

space while still having poor heat dissipation qualities.

A. THE INVENTION OF THE '655 PATENT

9. As stated in the '655 patent, "The present invention addresses dissipation of this heat without increasing the volume occupied by the individual drive." Col. 1, lns. 29-31. I addressed the heat dissipation problem by providing a plate that includes fins that are slanted up from the plate.

10. The '655 patent further provides: "To facilitate transfer of heat from plate 16 to the surrounding atmosphere, fixed louvers 18 or fins are struck up from the plate at various location. . . . In use, because the depression 17 is in contact with the drive motor, the heat of the motor is transferred to the plate 16 and **by means of the louvered fins** to the surrounding air." Col. 2, lns. 30-45 (emphasis added).

11. In other words, the plate is in physical contact with the hard disk drive for the purpose of conducting heat from the hard disk drive into the plate, and thus into the louvers. The heat in the plate and the louvers is then dissipated (i.e., radiated) into the atmosphere. The louvered fins facilitate the dissipation, or radiation, by increasing the surface area of the shield that is exposed to the atmosphere.

12. Moreover, because the louvered fins are slanted up from the plate at an acute angle, space is conserved while allowing efficient heat dissipation. Specifically, because of the consumer demand for compact electronic systems, disk drives must be positioned close to one another. Using louvered fins that are slanted up at only an acute angle, as opposed to being slanted up at a ninety degree angle, allows the disk drives to be positioned in close proximity to one another, satisfying consumer demands of compact systems while meeting the underlying purpose of dissipating heat from the disk drive.

13. The invention also has the additional advantage of using a separate heat sink to dissipate heat, as opposed to using the chassis of the disk drive. The use of a separate heat sink permits one to change the heat sink material to accommodate disk drives that generate different amounts of heat, as opposed to having to change the

entire material from which the chassis is made.

14. I have worked in the area of heat sinks for 32 years, and I am not aware of **any** heat sinks that use louvered fins that are slanted up at an acute angle prior to my conception of the invention. Moreover, prior to my invention, I have not seen any separate heat sinks used in conjunction with disk drives, much less heat sinks that use angled up louvered fins with disk drives.

III. THE SKUTT AND WILENS REFERENCES

15. I have reviewed and studied U.S. Patent No. 5,734,149, entitled "Kiln With Hinged Control Panel," by James E. Skut, et. al. (hereinafter "Skut"), and U.S. Patent No. 4,605,058, entitled "Heat Dissipating Retainer For Electronic Package," by Seymour Wilens (hereinafter "Wilens").

A. The Skutt Reference

16. The Skutt reference pertains generally to a kiln assembly that includes an electric heater and a hinged control box that houses control components for controlling the heat (i.e., temperature and duration) provided by the electric heater. Specifically, electronic controls 86 and relays/transformers 88 are attached to the front side 58 of the hinged control box 36 for controlling the heat that is provided by the electric heater. See Figure 4 and col. 4, lines 49-56. The stated purposes of Skutt include "[1] improv[ing] the thermal protection provided for the controls contained within the control box of the kiln assembly; [2] increase[ing] the cooling effect of air within the control box; and, [3] creat[ing] a chimney within a control box attached to a kiln assembly, wherein the chimney increases the dissipation of heat from the controls contained in the control box." Col. 1, lns. 51-63.

17. Because one of the purposes of Skutt is to **insulate** ("increasing thermal protection") the control components from the kiln, which is a primary source of thermal energy, the Skutt reference allows only minimal physical connection between the control components and the kiln. This is shown in Figures 6 and 7, where the only direct physical connection between the control box 36 (which houses the control components)

and the heated kiln is a latch (i.e., closure device 60) and a hinge (i.e., pin/receptacle 30, 38). See col. 4, lines 17-21.

18. As shown in Figure 4, a thermally insulated baffle 68, which includes a metal plate 70 and fiber insulation 72, is provided inside the control box 36, between the front side 58 of the control box 36 (where the electronics are housed) and the kiln. The fiber insulation 72 insulates the air within chamber 80 (which is created by the insulating baffle 68) from the warm air surrounding the kiln. Thus, the thermally insulated baffle 68 furthers the object of insulating the control panel from the kiln, also furthering the first object of Skutt. See Figure 5; and col. 4, lines 25-35.

19. The thermally insulated baffle 68 not only minimizes the amount of heat that can be conducted into the control box 36, but it forms a "chimney" 134 between the control box 36 and the kiln for circulating warm air away from the control box 36, meeting the objective of providing a chimney, which is the third object of Skutt. See Figure 6 and col. 6, lines 5-12.

20. As shown in Figure 4, air vents (i.e., openings) 102, 108 are formed in the top and bottom of the control box 36 through the use of louvers 100, 106. By angling the bottom louvers (i.e., 106) away from the kiln, cool air (indicated at arrows 110, 82, and 104) is allowed to circulate up through the insulated chamber (or "chimney") 80. See col. 4, lines 35-39; and col. 5, lines 20-33. This furthers the second object of Skutt, which is to increase the cooling effect of air within the control box.

B. The Wilens Reference

21. Wilens is directed to a springy metal retainer 10 (in the shape of a "W") for holding a flat, rectangular solid state package of electronic components 25 (e.g., transistors, capacitors, or resistors). See col. 1, lines 8-11; and col. 2, lines 53-60. Specifically, the metal retainer 10 includes tabs or tongues 28 for mounting the retainer 10 on a circuit board, and is constructed to dissipate heat from a heat generating electronic component 25. See Figure 2; col. 1, lines 43-47; and col. 2, lines 31-37.

22. Wilens also includes "a plurality of tabs 24 . . . to define openings or

louvers 26 which are spaced apart in a direction longitudinally of the retainer 10 . . . ." Wilens, Col. 2, lns. 29-32. "Heat generated in the electronic package [components] 25 is conducted away by the walls [] of the retainer. . . . Heat is further dissipated by **convection** through the louvers 26 and the holes 30 in the side walls []." Id at Col. 3, lns. 3-9. Thus, as stated in Wilens, the purpose of the louvers is to allow heat to dissipate by convection (by allowing air to flow—uninhibited—through the louvers 26 formed by the tabs 24).

IV. IT WOULD NOT BE OBVIOUS TO COMBINE THE SKUTT AND WILENS REFERENCES

23. I have reviewed and studied the Office Action pertaining to this application dated June 18, 2002. In particular, I have reviewed and studied the Examiner's assertion that the invention claimed would be obvious under 35 U.S.C. § 103(a) in light of Skut in view of Wilens. The Examiner stated that "Skutt teaches the structure of the plate having a plurality of louvers being attached to an electrical device and the structure reads on the claims, Wilens teaches a heat dissipating device having louvers-like elements attached to a heat generating component and it would be obvious to combine the teachings of Wilens and Skutt for someone versed in the art." (6/18/02 Office Action, pp. 4-5.)

24. I respectfully disagree with the Examiner's conclusion under three premises: (A) there is not an explicit or implicit suggestion in the cited references to combine the Skutt and Wilens references, nor is there any suggestion within the knowledge of one of ordinary skill in that art, such as myself, to combine the two references; (B) combining the Skutt and Wilens references would render both the Skutt and the Wilens references unsatisfactory for their intended purposes; and (C) both the Skutt and the Wilens references teach away from combining the structures to form a structure in the manner suggested by the Examiner.

A. There Is No Suggestion In The Cited References, Neither Explicit Nor Implicit, Nor in The General Knowledge of One Skilled In The Art To Combine the Skutt and Wilens references.

25. The Examiner asserted that Claims 1-22 were obvious over Skutt in view of Wilens, in that Skutt discloses "a shield 58 comprising [a] rectangular plate with a plurality of louvers" and Wilens discloses "a shield attached to a heat generating device 25." The primary flaw in this argument is that there is no motivation or teaching to combine Skutt with Wilens. As a whole, the nature of the problems to be solved by the Skutt and Wilens references are different, and there is no explicit or implicit teaching within the Skutt and Wilens references to combine the two references; and there is no suggestion within the general knowledge in the art that would lead one of ordinary skill, such as myself, to combine the two references.

26. The nature of the problem to be solved in Skutt is to insulate the control component(s) from the kiln, which releases thermal energy. The control component(s) is insulated from the kiln by a thermally insulating baffle, which also forms a chimney. Louvers are used to create air vents (similar to the air vents found in a house) for directing air into, and out of, the chimney.

27. The nature of the problem to be solved in Wilens, on the other hand, pertains to the situation where the object releasing heat and the object to be kept cool are the same, i.e. electrical components. Wilens addresses this problem by using a springy metal retainer in direct contact with the electrical component. Thus, the problems to be addressed are different: Skutt is for **insulating** the control component(s) from the kiln, which releases heat, and Wilens is for **dissipating** heat from electrical components, the object creating heat.

28. Indeed, as I described above, there was not previously a need to dissipate heat from disk drives, and when such a need arose, other disk drives simply used a chassis having a large volume for air spacing and the same chassis top as a make-shift heat sink. I am not aware of anyone who used a separate heat sink, apart from the

chassis, to dissipate heat from a disk drive. Thus, it would not have been obvious to combine the structures of the Skutt and Wilens patents in the manner suggested by the Examiner.

29. Thus, as one of ordinary skill in the art, I state that there is no motivation, based on the nature of the problem to be solved, the teachings of the prior art, nor the general knowledge in the art, to combine the Skutt and Wilens references.

B. Combining The Skutt And Wilens References Would Render Both References Unsatisfactory For Their Intended Purposes.

30. The purpose of the "louvers" in Skutt is to direct cool air through a chamber in which a control component(s) to be kept cool resides. This accomplishes the overall goal of keeping the control unit cool.

31. The purpose of the "louvers" in Wilens is heat convection. Thus, tabs are formed on the walls of the object disclosed in Wilens, and the tabs form unimpeded openings (also referred to, in Wilens, as "louvers"). The openings allow air to flow out of the tabs unimpeded, furthering the heat convection purpose of the openings.

32. Incorporating the "louvers" disclosed in Skutt in place of the tabs disclosed in Wilens would render the Wilens springy retainer unsatisfactory for its intended purpose because the Skutt "louvers" would impede the free flow of air, whereas the openings formed by the Wilens tabs permitted air to flow freely. This occurs because the purpose of the Skutt "louvers" is to **direct** air, whereas the purpose of the openings formed by the Wilens tabs is to permit heat convection, i.e. unimpeded air flow. As a result, combining the Wilens and Skutt references in the manners suggested by the Examiner would render both references unsatisfactory for their intended purposes.

C. The Skutt And Wilens References Teach Away From Combining The References.

33. Skutt actually teaches away from using the air vent as a heat dissipater.

Skutt discloses a control box that houses a control component(s) that is designed to be insulated from a heat generating device (as opposed to a heat sink). The main objective of Skutt is to create a control box for a kiln that is kept cool, in part, by not conducting heat from the kiln. According to the specification, the control box is only connected to the kiln through hinges and a clasp, which minimizes the "direct thermal contact" with the kiln, and creates a large air space, or "chimney" between the control box and the kiln. See Figures 6 and 7; col. 4, lines 17-22; and col. 6, lines 5-12.

34. This is the complete opposite of the present invention, which provides direct physical contact between a shield (i.e., a plate and louvers) and a hard disk drive for the purpose of dissipating heat from the hard disk drive. Thus, it is clear that Skutt actually teaches away from using louvered air vents to dissipate heat from a heat generating device, such as a hard disk drive.

35. Because there is no motivation or teaching to combine Skutt and Wilens, and because Skutt and Wilens, either alone or in combination, fail to disclose the use of louvers (as described in the present application) to "dissipate heat to the atmosphere" as required by Claim 1, or "dissipate heat from said plate" as required by Claims 4 and 9, I believe that Claims 1, 4, and 9, as well as Claims 2-3, 5-8, and 10-16, which depend from the aforementioned independent claims, are novel over the Skutt and Wilens references.

36. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 or Title 18 of the United States Code and that such willful false statement may jeopardize the validity of the reissue application or any reissue patent issued thereon.

Date: SEP 12, 2002

William L. Grouell